Wireless Mobile Broadband Setup Guide for Linux OS

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HISTORY

Version	Comments
1.0	Initial draft version
1.1	Added WVDIAL commands
1.2	Added working with multifunction devices
1.3	Added Sierra 598U and Novatel U760
1.4	Added Sierra AC402, Novatel C777 and EM760

INTRODUCTION

This document describes how to set up and connect to the Internet using a **Sprint Wireless Modem** on the **Linux** platform using open source software packages.

Please note that this document is provided to guide current Linux users to be able to use Sprint Wireless Modems on any graphical Linux distribution, however, the setup instructions in this document has been tested with Ubuntu Linux 6.10 and above. For setup on other Linux distributions, you should still be able to follow the instructions after you download and install the necessary software packages outlined below. Instructions in this document are only meant to guide the user and its information may change at any time.

REQUIREMENTS

Before you can connect to the Sprint Wireless Broadband network, you will need the following:

- Wireless modem that has been activated on a Windows machine. The modem should be associated with an account with Sprint.
- Linux installation such as Ubuntu Linux 6.10, Knoppix live CD, OpenSuSe 10.1 or later, or Fedora Core/Redhat Linux 6 or later.
- **NOTE:** There is a known bug with Ubunto 9.04 where it does not have the ability to detect the usbserial port unless it is set as a module versus part of the kernel. See details at the link below.

  https://bugs.launchpad.net/ubuntu/+source/linux/+bug/345002

- Linux installation should be running Kernel 2.6.x.x or later.
- KPPP Modem Dialing software application.

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KNOWN LIMITATIONS

- System/User can not monitor card status, ie, software does not show information about signal strengths, network service type, and connectivity status. The only network indication available is by wireless card LED that shows whether the card is in a Sprint coverage area (Solid) or transmitting data (flashing).
- Card updates (PRL, firmware and activation) features are not available. This can be done on a Windows machine at least for the activation of the device.
- Maximum connection speed is limited by the current generic usbserial driver to approximately less than 500kbps.
- Driver loading is done on the command line (can be automated by adding the commands to a startup script that is run at boot time).

SETTING UP YOUR SYSTEM

1. This setup assumes that you have installed the usbserial driver distributed on your Linux CD according to the instructions in the driver installation readme file. Ubuntu has this setup by default.

2. Open an xterm window unload the usbserial driver by entering (you will be required to enter the root password after entering this command):

   "sudo modprobe –r usbserial"

   After unloading the USB driver you should be returned to the command prompt.

3. On the terminal, load the driver to match your card Vendor ID and product ID. Please lookup the proper product ID in Table 1.

   "sudo modprobe usbserial vendor=[vendorID] product=[prodID]"

   Where prodID is the proper product ID that corresponds to your modem card in Table 1. Although it is not necessary to verify the result of running the command above, but if you want to be sure that the driver is now associated with your card. Plug in your card to the computer and make sure you have power then run the following on the command-line:

   "sudo dmesg|grep –i ttyUSB"

   You should see something like:

   usb 5-1: generic converter now attached to ttyUSB0
   usb 5-1: generic converter now attached to ttyUSB1

   Now the driver has been loaded and validated you need to setup the dialer.

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Table 1. Mobile Broadband Wireless modem products identification numbers.

Broadband Modem model	Vendor ID	Product ID	Form Factor	Multifunctional
Novatel Merlin S620	0x1410	0x1110	PC Card	No
Novatel Merlin S720	0x1410	0x1130	PC Card	No
Novatel Ovation U720	0x1410	0x2110	USB Modem	No
Novatel Merlin EX720	0x1410	0x1120	Express Card	No
Novatel C777	0x1410	0x5051	2N1 Express Card	No
Novatel U727	0x1410	0x4100	USB Modem	Yes
Novatel U760	0x1410	0x6000	USB Modem	Yes
Novatel EM760	0x1410	0x8000	Module	No
DELL Novatel EM760	0x413C	0x8180	Module	No
Pantech PX-500	0x106C	0x3702	PC Card	No
Sierra AC580	0x1199	0x0112	PC card	No
Sierra AC595	0x1199	0x0019	PC Card	No
Sierra AC595U	0x1199	0x120	USB Modem	No
Sierra Compass 597	0x1199	0x0023	USB Modem	Yes
Sierra AC597E	0x1199	0x0021	Express Card	Yes
Sierra 598U	0x1199	0x0025	USB Modem	Yes
Sierra AC402	0x1199	0x0027	2N1 Express Card	Yes

With the EVDO device installed in another terminal window you can also confirm you have setup the correct the vendor and product ID's by issuing the “lsusb” command.

4. Make sure you have a working connection to the internet. It is recommended that you have an Ethernet connection in order to download the necessary packages for this setup. You can verify your computer’s connection to the internet using one or both of the following commands, separately:

   “ifconfig”: You should see eth0 interface for a wired Ethernet interface connection with an acquired IP address, or you use the command:

   “ping” “the name of your favorite web site without quotes”

INSTALLING PPP PACKAGES

5. Download a few packages: Please note that the instructions in this section describe the procedure for installing the necessary software packages on Ubuntu Linux 6.10. The procedure is very similar on other Linux distributions which support KPPP and KPPPLogview.

   - From the Ubuntu Applications menu, click on Add/Remove, and Add/Remove Applications utility should start.

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- Select "All" from the software application category on the left.
- In the Search field type "ppp"
- Select KPPP and KPPPLogview.
- Click on Apply button located at the bottom of the Add/Remove Applications Window.
- The downloading of these software packages will start and automatic installation will follow automatically. You should see something similar to the windows shown in Figure 1 below.

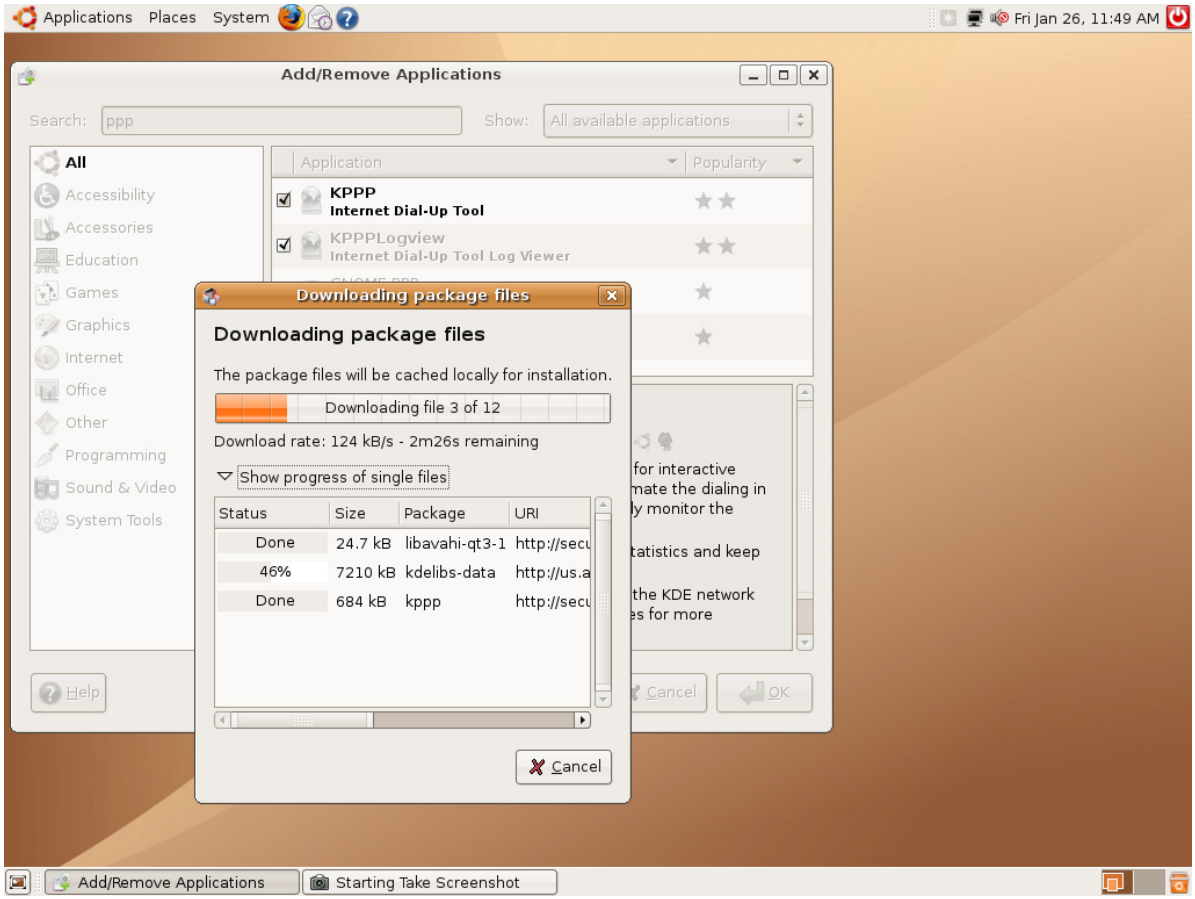

Figure 1. Add/Remove Applications utility downloading the selected packages. Installation should follow downloading automatically.

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6. When the software installation procedure, you should see something similar to Figure 2 below:

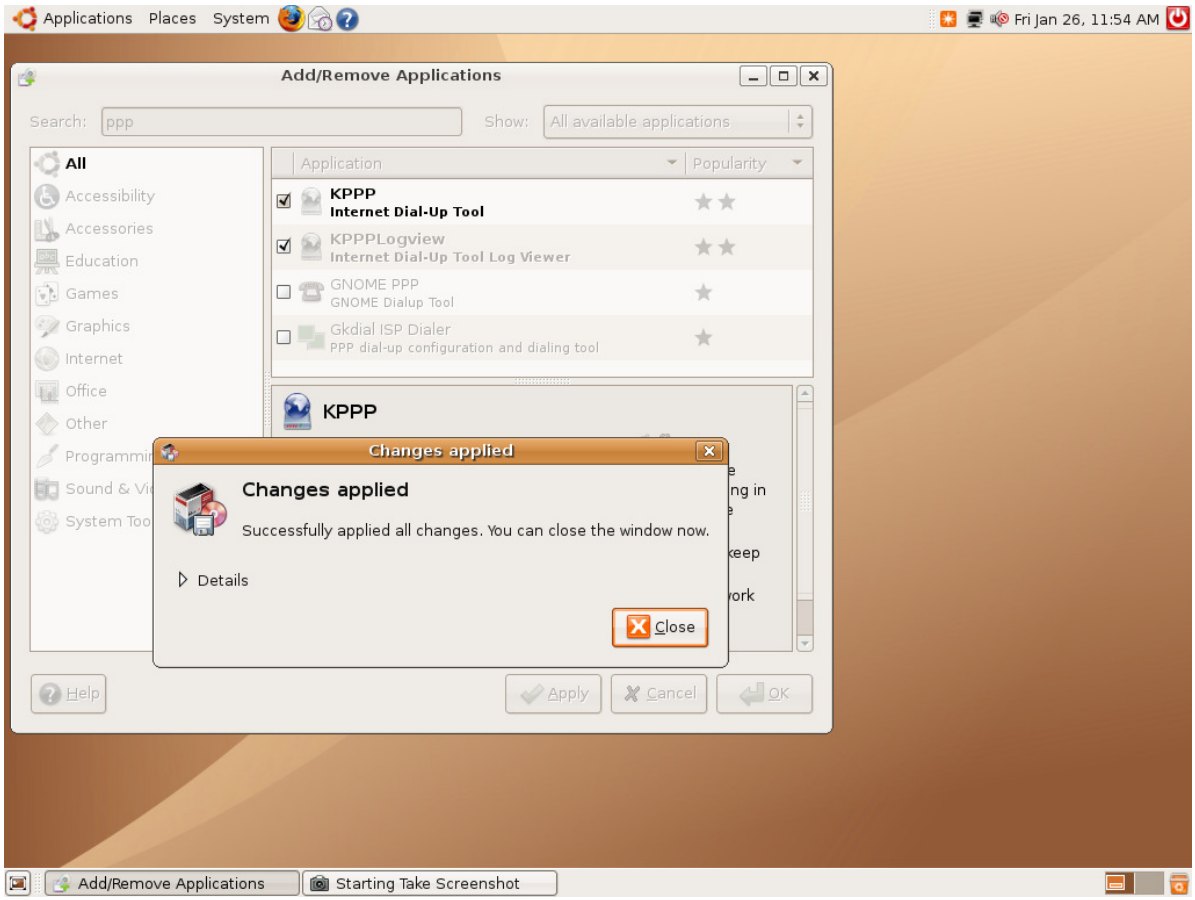

Figure 2. Add/Remove Applications utility finished installing the select software packages and successfully applied changes to the system.

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SETTING UP PPP USING KPPP

7. Start the KPPP software application by clicking the KPPP item from the Applications/Internet Menu. When the KPPP windows opens, click on Configure… button to launch KPPP Configuration windows. You should see the KPPP Configuration window similar to the one shown at the bottom in Figure 3 below.

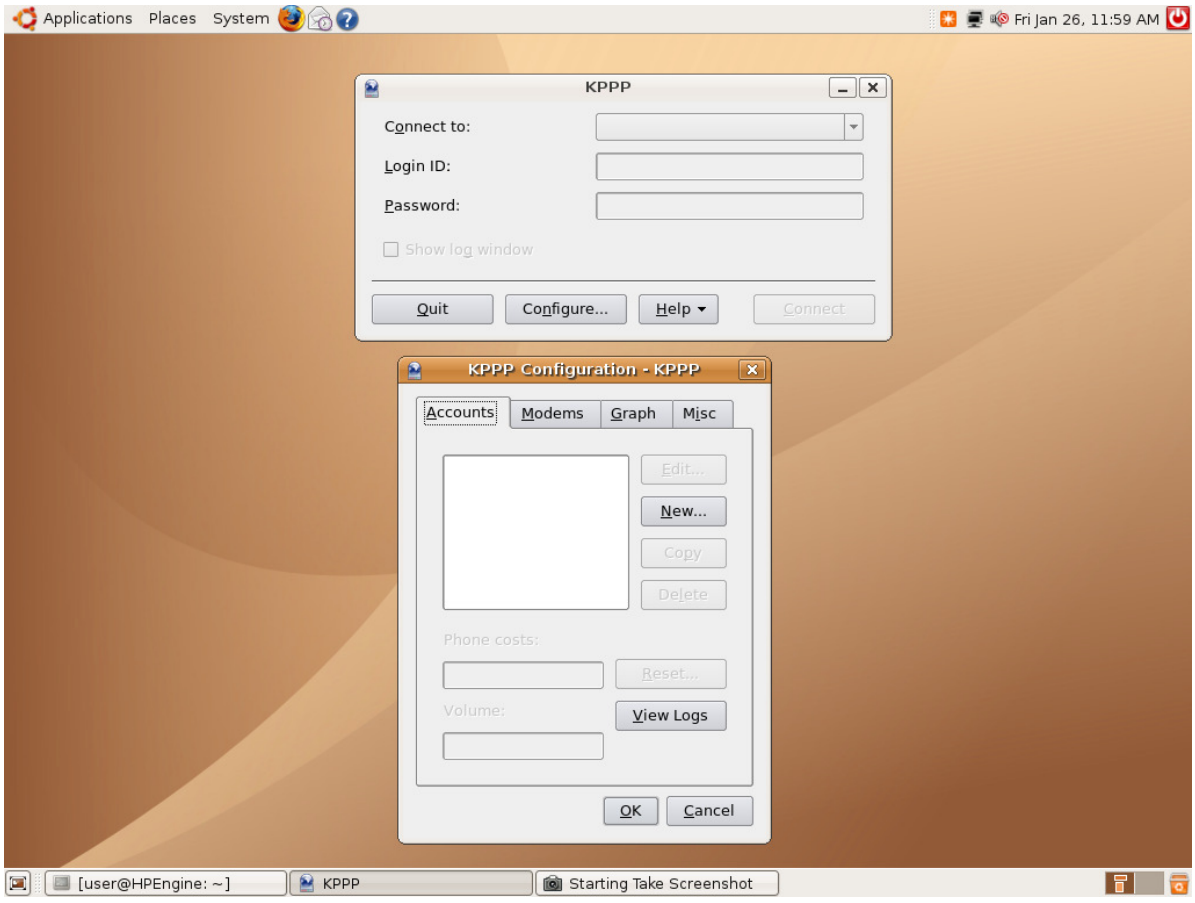

Figure 3. KPPP application window at the top and KPPP Configuration window at the bottom.

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8. On the KPPP Configuration window's Accounts tab, click on New… button to start a "Create New Account - KPPP" dialog window. Figure 4 below shows this dialog window. Click Manual Setup button in the latter window. The New Account Manual Setup dialog window will open as shown in Figure 5.

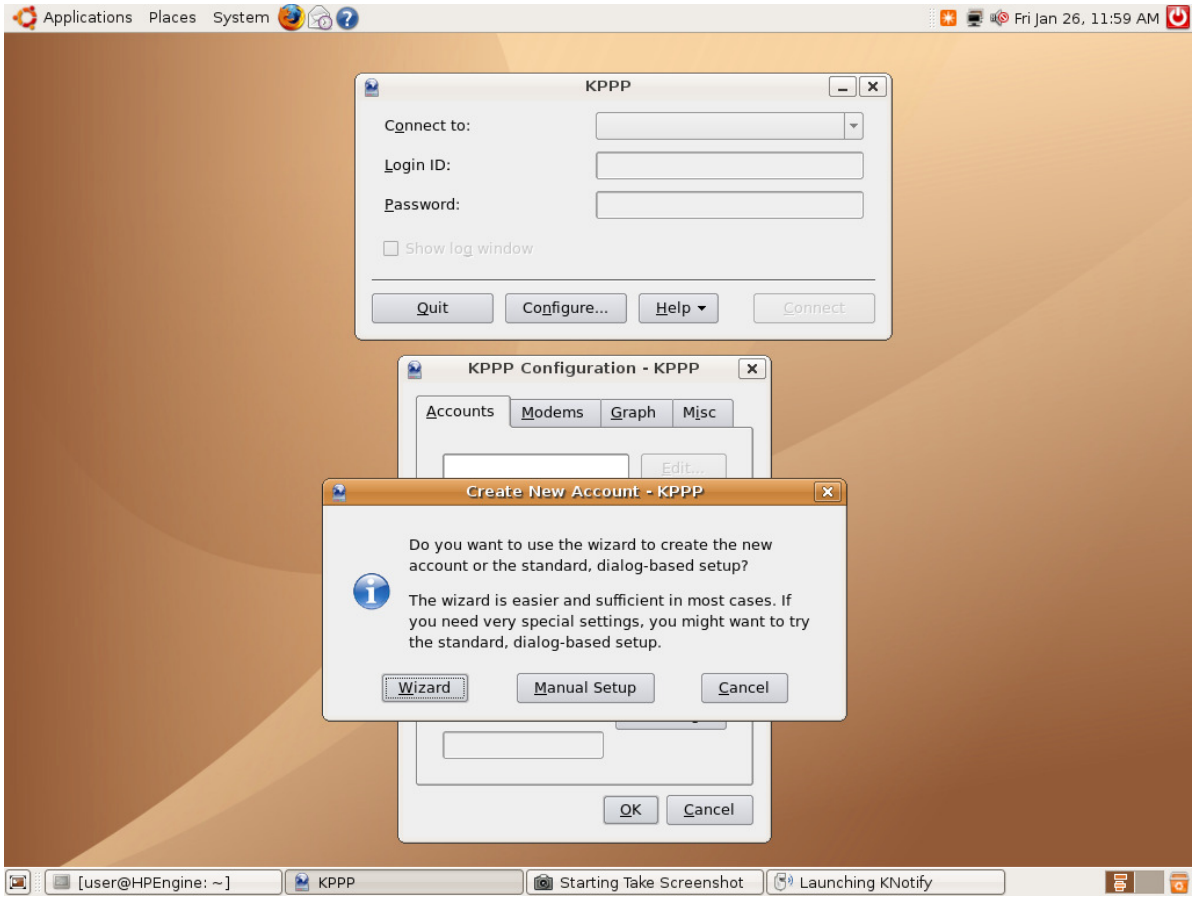

Figure 4. Create New Account – KPPP dialog window is open as a child window of the KPPP Configuration dialog window. Select Manual Setup.

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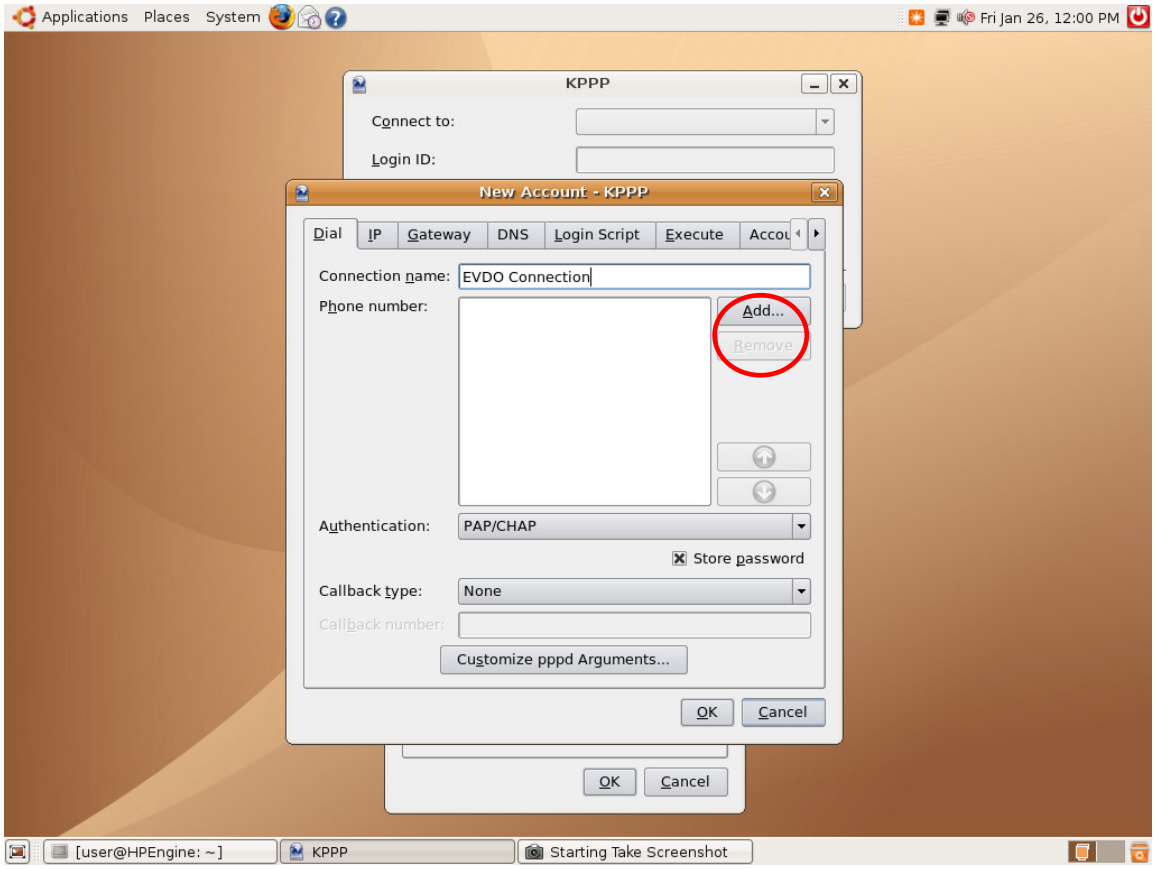

Figure 5. New Account – KPPP dialog window is open as a child window of the Create New Account dialog window.

9. On the Dial tab, type "EVDO Connection" in the Connection name field as shown above in Figure 5.

10. Click Add… button to open the Add Phone Number dialog window. In the Add Phone Number dialog enter **#777** and click OK. Click OK button on the New Account dialog window without any further changes.

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11. Once you are back to the KPPP Configuration dialog window, click on Modems tab at the top and then click New… button as shown in Figure 6 below.

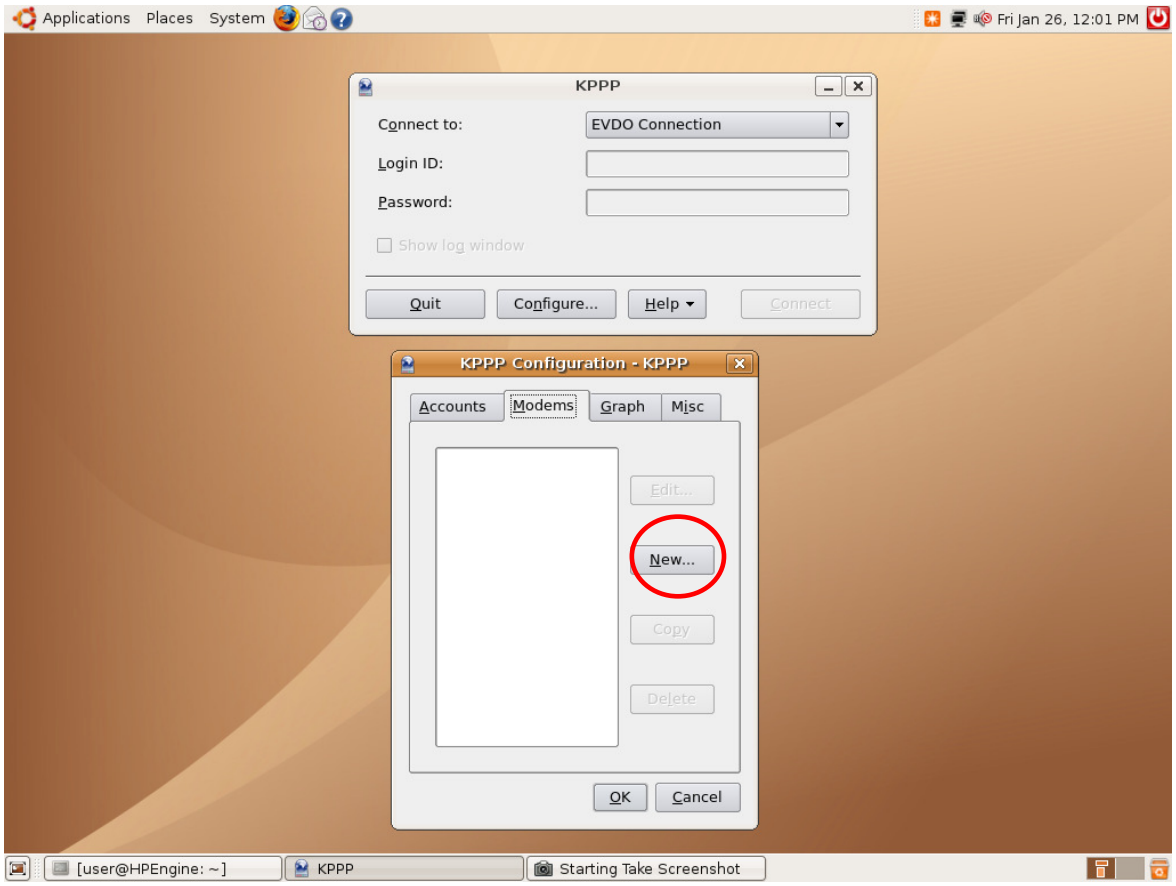

Figure 6. Modem tab of the KPPP Configuration Window.

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12. In the New Modem Window, click on the Device tab and enter the data as shown in Figure 7 below. After entering/selecting the parameters in the New Modem dialog window, click OK and return back to the KPPP Configuration dialog window.

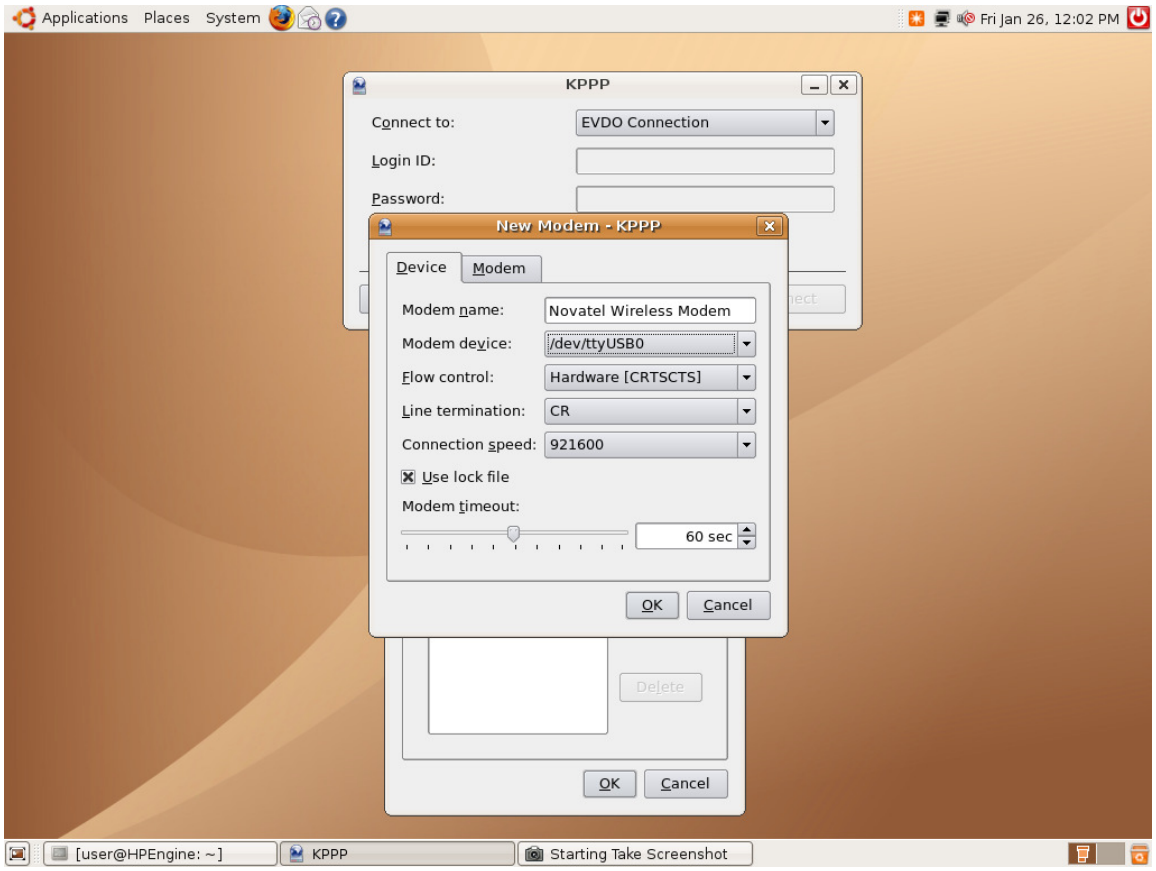

Figure 7. Device tab of the New Modem dialog window showing the parameters needed for Modem Name, Modem device, Flow control, Line termination, and Connection Speed fields.

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13. To verify that KPPP is able to communicate with the modem card, select the Wireless Modem (or whatever you entered in the Modem name field of the New Modem dialog window) and click on Edit… button in the KPPP Configuration dialog window.

14. When the Edit Modem window for the Wireless Modem is open as shown in Figure 8 below, click on the Modem tab and then click on Query Modem… button.

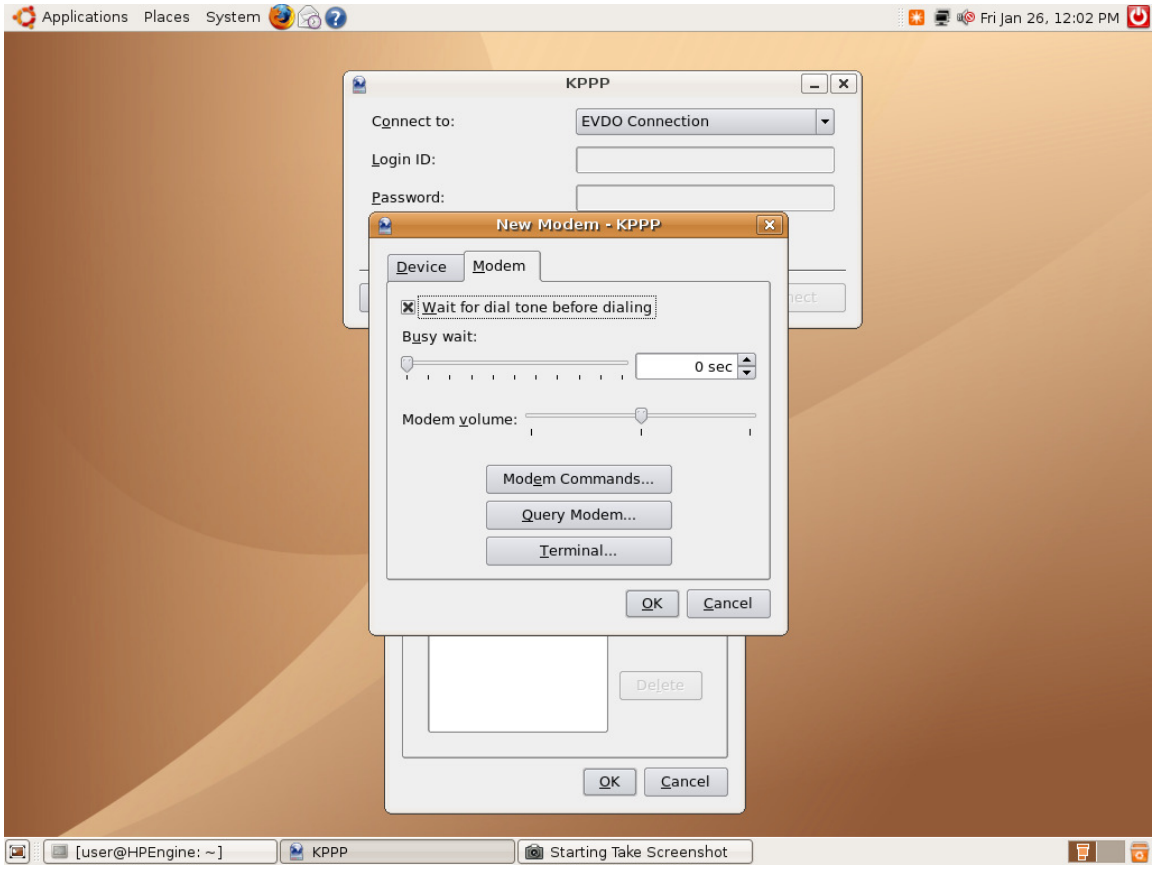

Figure 8. Modem tab in the New Modem window.

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15. If the modem driver is properly setup and the connection is properly configured then you should see a multi-line response similar to the window shown in Figure 9. If you do not see this response, please try the setup procedure again. Click OK to dismiss the Modem Query Results window.

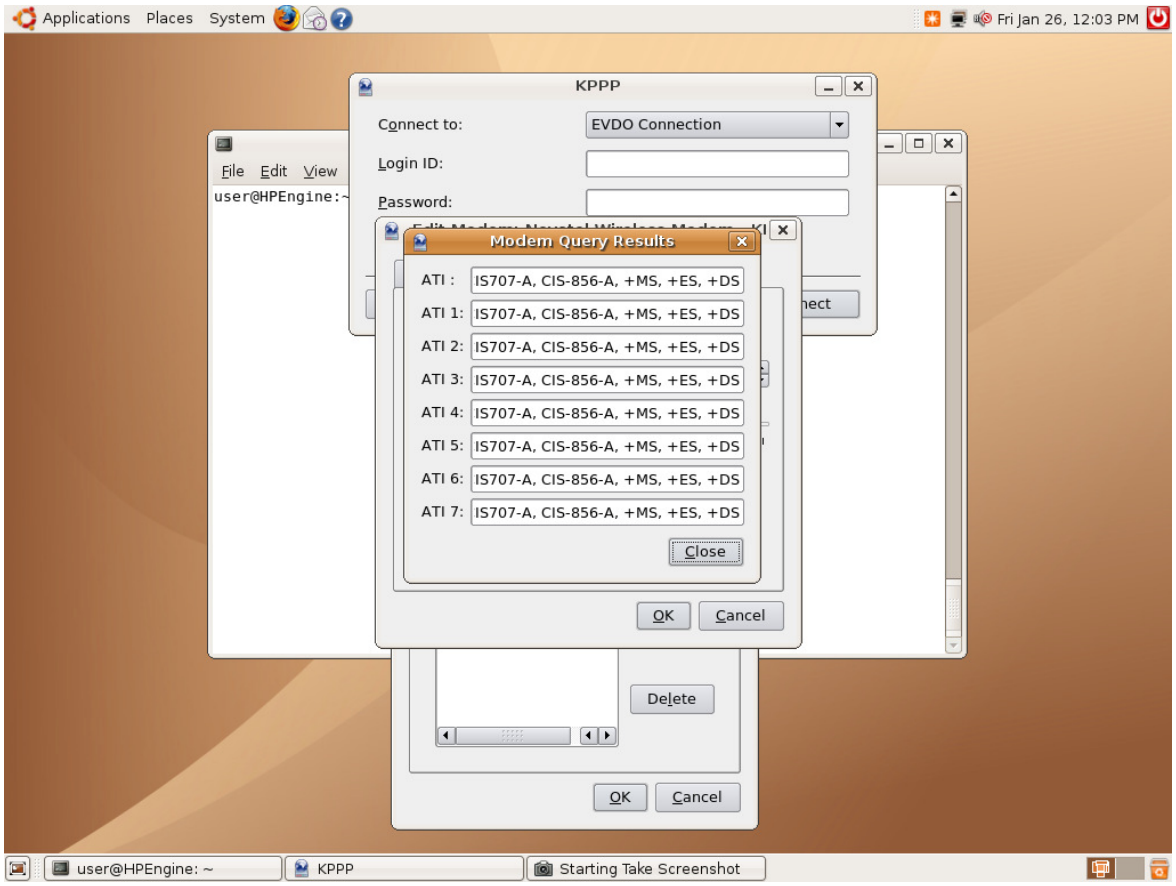

Figure 9. Successful Modem Query Results window showing the response sent by the card to ATI command sent when the Query Modem button is clicked.

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16. On the KPPP Configuration window, select Misc tab. Check Dock into panel on connection as shown in the bottom window in Figure 10 below then click OK to save KPPP configuration.

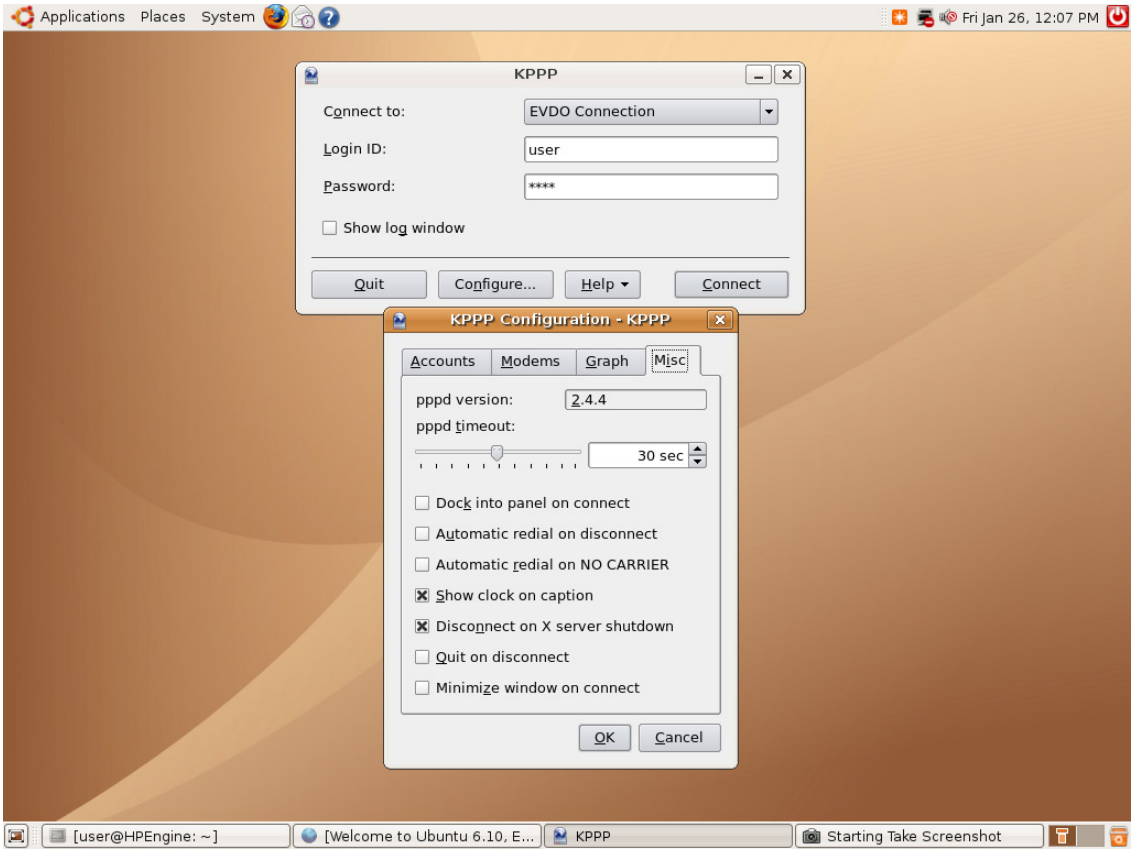

Figure 10. KPPP Configuration Misc tab settings.

17. At this point you are done with setting up your dialer software to connect to the network using your Wireless Broadband modem card.

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CONNECTING USING YOUR WIRELESS CONNECTION

In this section, you will start a ppp connection to the network.

1. If KPPP is not launched, start KPPP from the Application/Internet menu.

2. In the KPPP window, select the connection you have set up according to the instructions above. We suggested naming the connection as "EVDO Connection" for simplicity. This connection name should be shown in the "Connect to" drop down list of KPPP. Enter "user" as the Login ID and "user" as the Password as shown in Figure 11 below. On EVDO cards, any Login ID and Password will work since they are not required by the card but the fields have to be filled in with values to prevent KPPP from reporting an error.

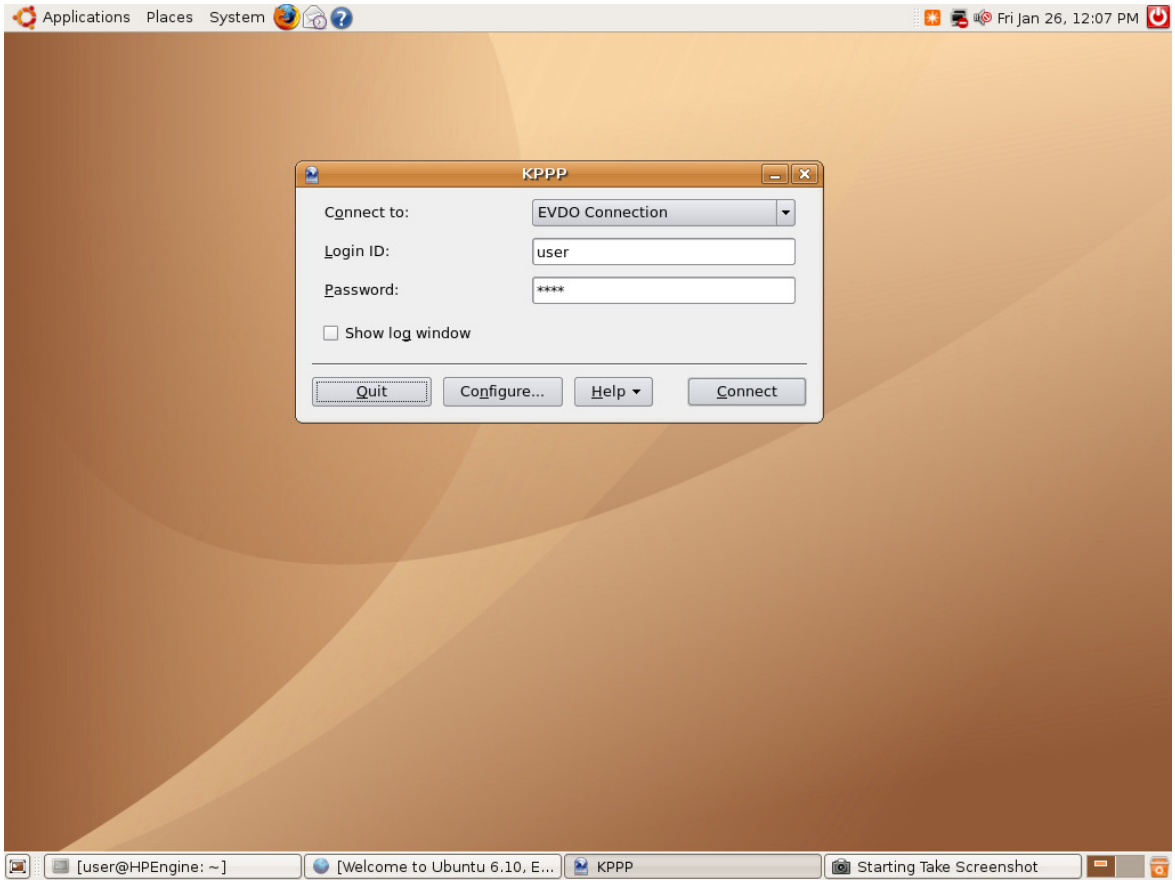

Figure 11. KPPP's main window showing the EVDO Connection selected.

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3. Click on Connect button to start a PPP connection to your service provider's wireless network. If the connection is established successfully you should see a Globe icon close to the Network Connection icon on the system panel as shown in Figure 12 below.

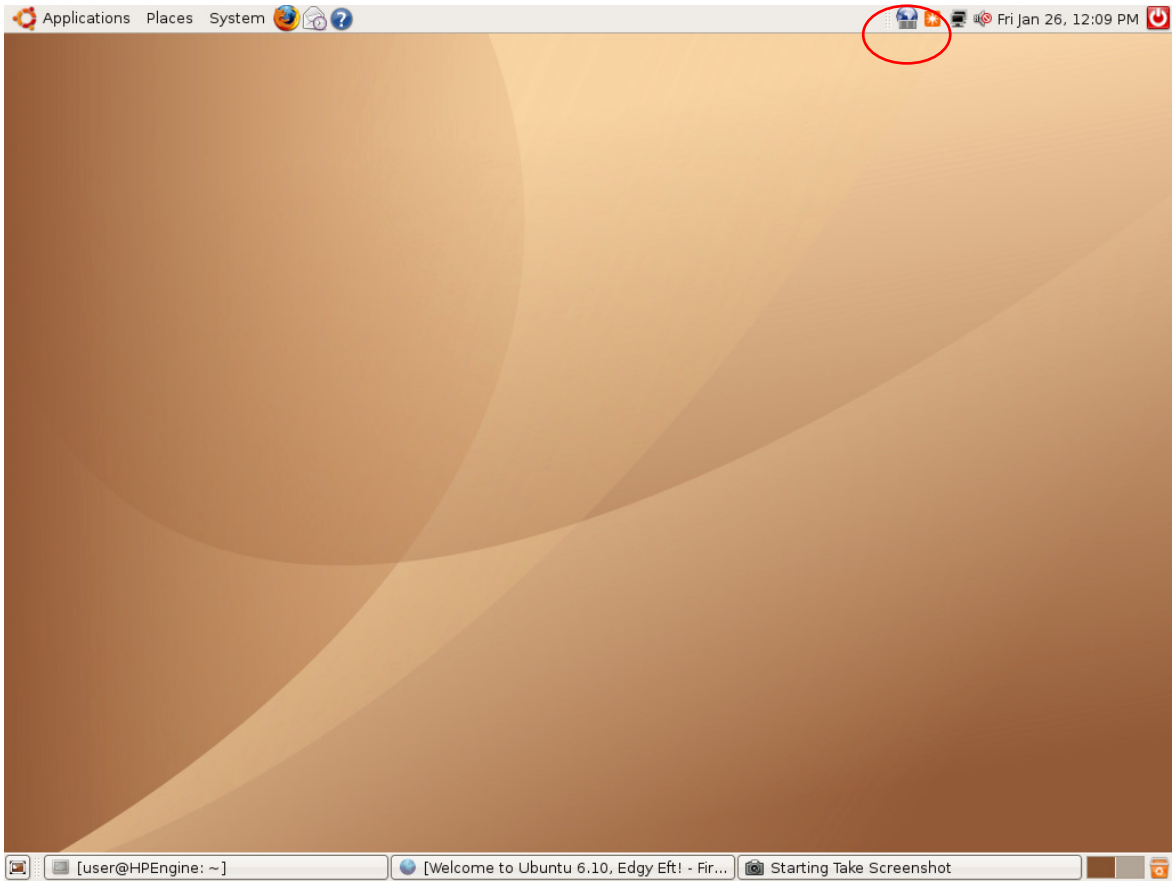

Figure 12. Connection established and a Globe icon is shown at the top right side of the window.

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4. If you Network Connection icon still shows eth0 as in Figure 13, click on the Network Connection icon and **select ppp0** in the Connection Name drop down list as shown Figure 14.

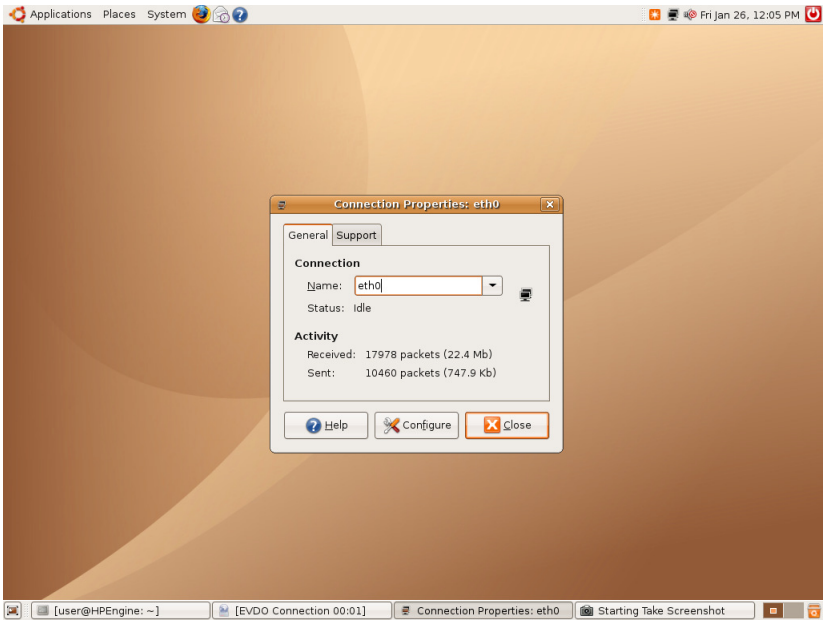

Figure 13. Connection Properties dialog launched by double-clicking on the Network Connection icon at the top right side in the system panel next to the speaker (sound volume) icon.

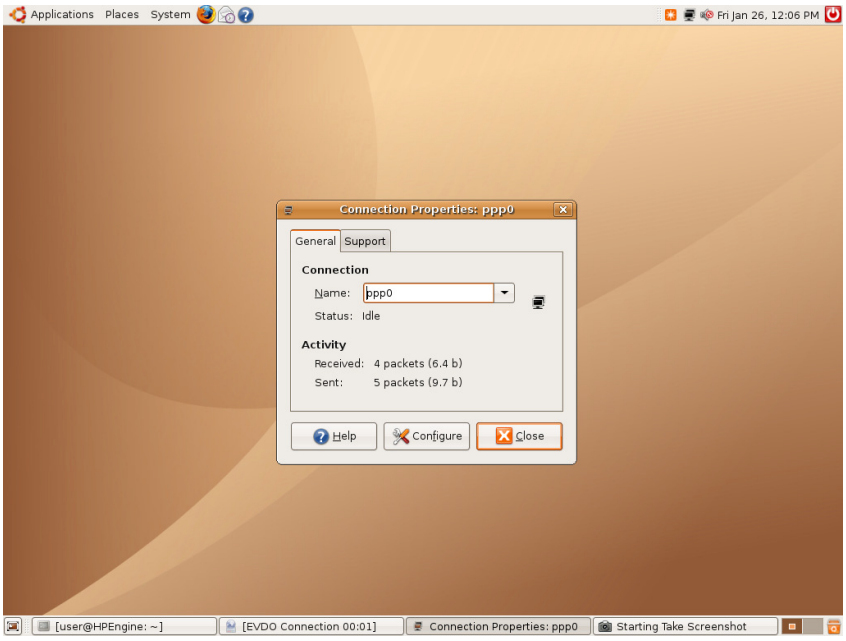

Figure 14. Connection Properties dialog showing General tab's Connection Name drop down menu selection switched to ppp0.

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5. Once connected, you can click on the Globe icon to show your KPPP connection window as shown in Figure 15. You can also click on the Details button on the KPPP connection window to show the connection statistics.

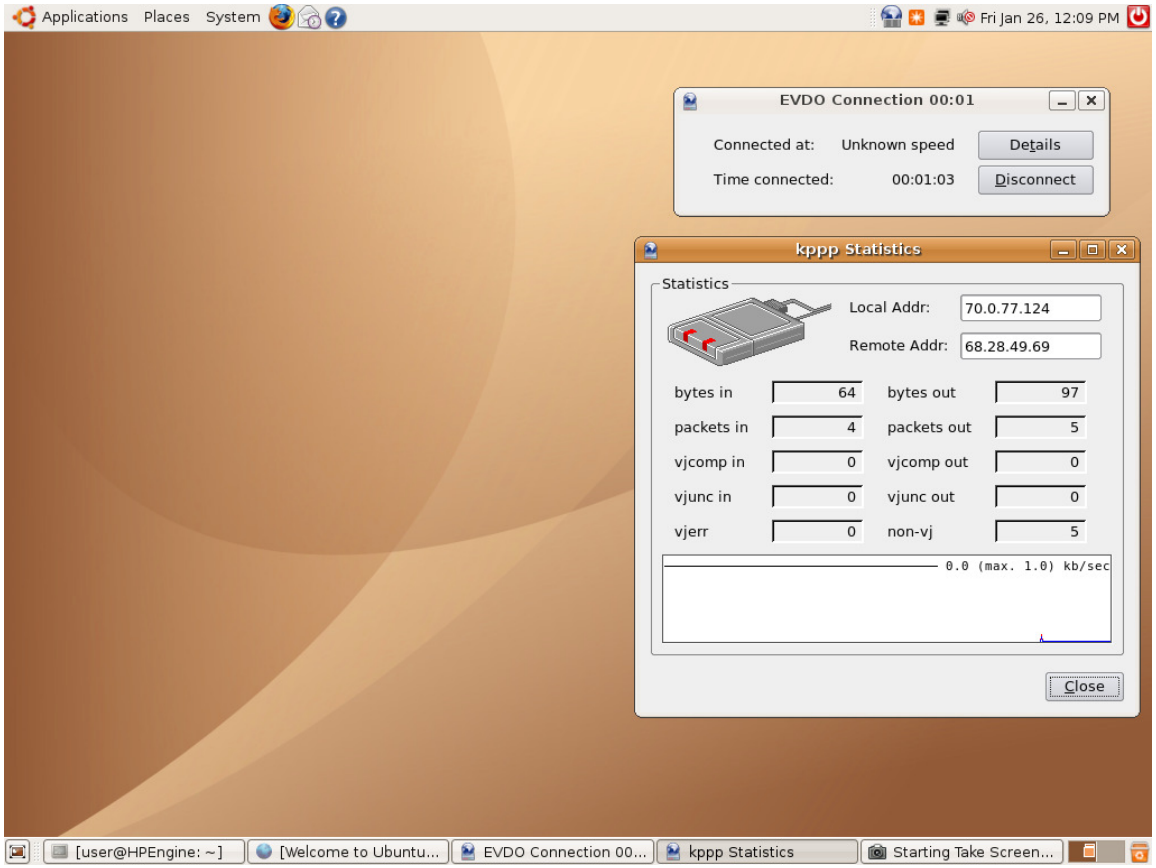

Figure 15. KPPP Connection window showing successfully established EVDO Connection including time connected and connection statistics in the KPPP statistics window.

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6. Launch Firefox or your favorite internet browser to request your favorite website. Since we are using Ubuntu Linux, we chose to view Ubuntu's website.

Figure 16. Above shows successful loading of the www.ubuntu.com main page over a ppp0 connection.

DISCONNECTING FROM YOUR WIRELESS CONNECTION

To disconnect your connection session, click on Disconnect button on KPPP's main EVDO Connection window as shown in Figure 16.

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SETTING UP PPP USING WVDIAL

Now that we have shown you how to setup a connection using KPPP below is another method for those who are more comfortable with Command Line Interface (CLI). You will still need to perform steps 2-3 so that your device can be recognized by the OS. This also assumes you have already downloaded wvdial (pronounced Weave Dial) and installed on your current Linux distribution. This is available by default in Ubuntu. After that you will need to run the following steps.

Open a terminal window and type the following:

"sudo wvdialconf"

This file is typically located in /etc/ppp/peers/

This will scan for available modems and create a basic configuration file called wvdial.conf.

After running the command above you will need to modify the "/etc/wvdial.conf" file using your favorite text editor. I chose "sudo gedit wvdial.conf"

Below is a sample wvdial.conf file:

```
[Dialer Defaults]
Modem = /dev/ttyUSB0
Baud = 460800
Init1 = ATZ
Init2 = ATQ0 V1 E1 S0=0
&C1 &D2 +FCLASS=0
ISDN = 0
Modem Type = USB Modem
Phone = #777
Username = ''
Password = ''
Carrier Check = no
Stupid Mode = yes
```

Notes: You don't need a username or password to initiate the ppp link.

Also, you need to disable the carrier check and enable "Stupid Mode", which makes wvdial skip any detection and just launch pppd.

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To dial out simply type "wvdial" or "sudo wvdial" depending on your distribution version. You will need to keep this window open during your connection and you can disconnect by simply hitting "CTRL-C". Below is a sample.

```
# wvdial

--> WvDial: Internet dialer version 1.56
--> Initializing modem.
--> Sending: ATZ
ATZ
OK
--> Sending: ATQ0 V1 E1 S0=0 &C1 &D2
+FCLASS=0
ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
OK
--> Modem initialized.
--> Sending: ATDT#777
--> Waiting for carrier.
ATDT#777
CONNECT
--> Carrier detected.  Starting PPP
immediately.
--> Starting pppd at Tue April 10 12:25:55
2007
--> pid of pppd: 5754
--> Using interface ppp0
--> local  IP address 1.2.3.4
--> remote IP address 2.3.4.5
--> primary   DNS address 5.6.7.8
--> secondary DNS address 6.7.8.9
```

Notes: DNS servers are detected automatically.

IPs are fake in this sample

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USING DATA DEVICES WITH AUTO-INSTALL CD

Working with devices that have multiple functions can sometimes be tricky and requires a few extra steps. For devices that support internal memory that is often seen as a CD drive users can often install automatically for Windows systems. This is not the case for Linux.

When the device is inserted, the auto-install CDROM will be mounted and will open up a file browser window as shown in Figure 17 using Ubuntu Live CD. Auto-install is specific to certain multifunction devices such as the Novatel U727 and Sierra 597 modems. In order to be able to use the modem to establish communication, you should right-click on the CDROM drive, as highlighted in the Figure below and select "Eject" from the context menu to unmount and eject.

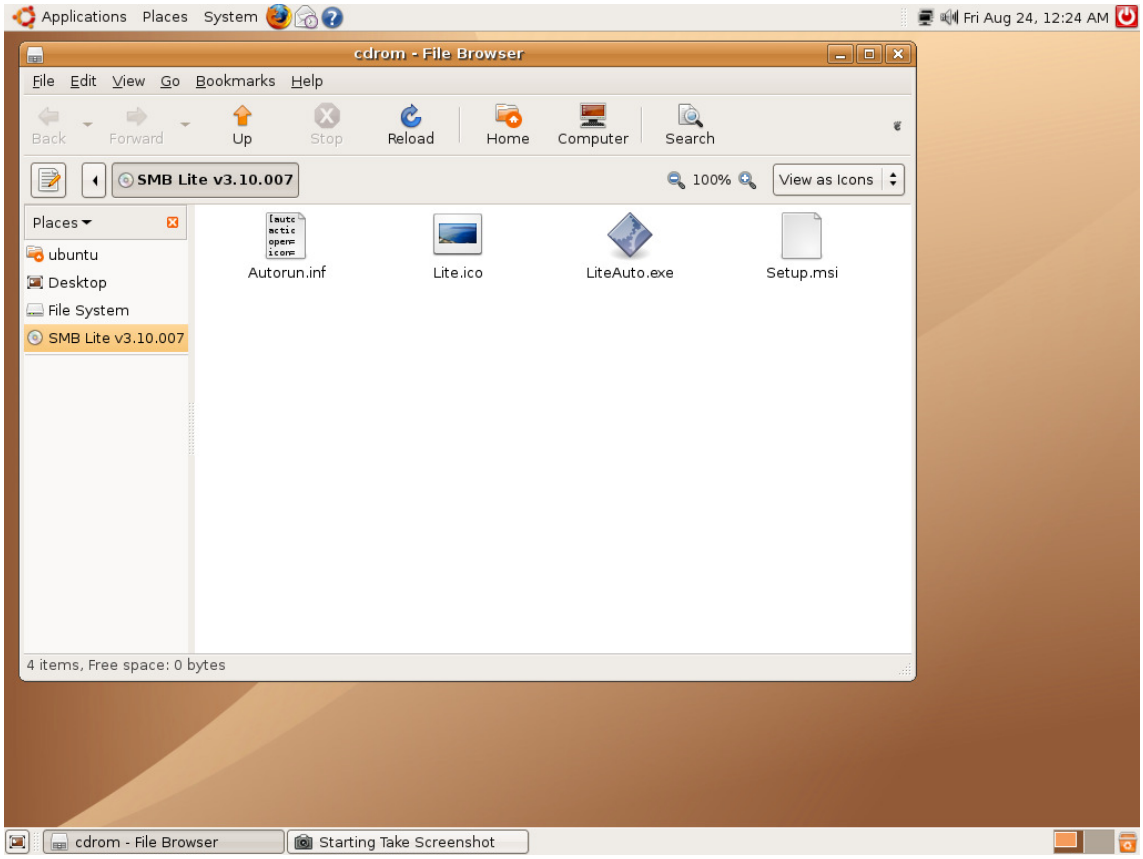

Figure 17. Auto-Install CDROM of the Sprint modem is mounted and launches file browser automatically.

On distributions that do not have the capability to mount CDROM automatically, the command line interface (also known as the Linux Shell) can be used to eject the auto-install CDROM using the following command:

sudo eject /dev/cdrom

NOTE:
CDROM device special file is allocated dynamically. It could be /dev/sr0, or /dev/sr1 …etc. Yours may vary. For my test I used /cdrom.

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Assuming that "cdrom" is the device special file associated with the auto-install CDROM that needs to be ejected. Once ejected the device should change to Modem and Storage mode.

USING DEVICES WITH MICRO SD STORAGE CAPABILITY

As mentioned above multifunction devices often require several steps to get access to the modem or mass storage. In the example below using a U727 once you eject the CD the device will change to modem and storage mode. If the micro SD storage card is inserted in the SD slot of the modem, file browser will launch automatically to show the SD card drive as show in Figure 18 below. In addition, the SD card drive will be shown as an icon on the desktop as shown in Figure 19.

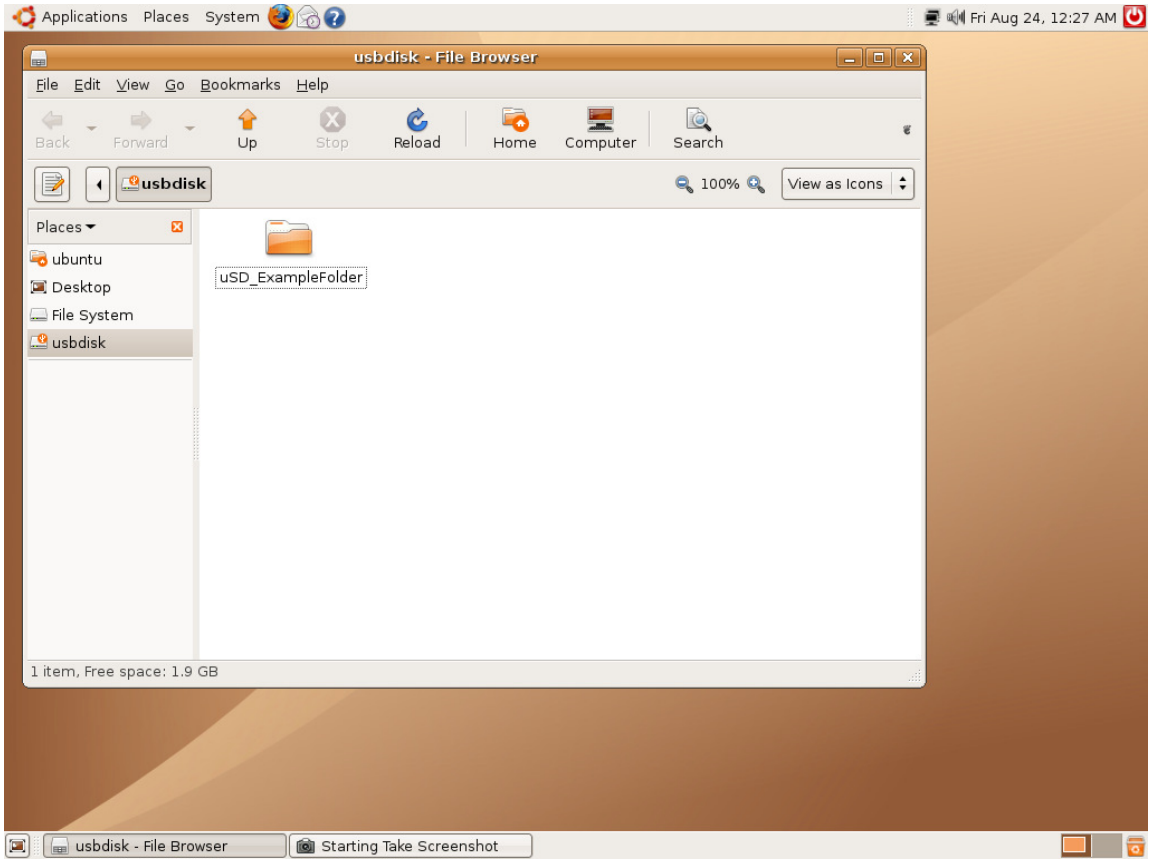

Figure 18. The micro SD card mounted automatically as a usbdisk drive on Ubuntu Linux.

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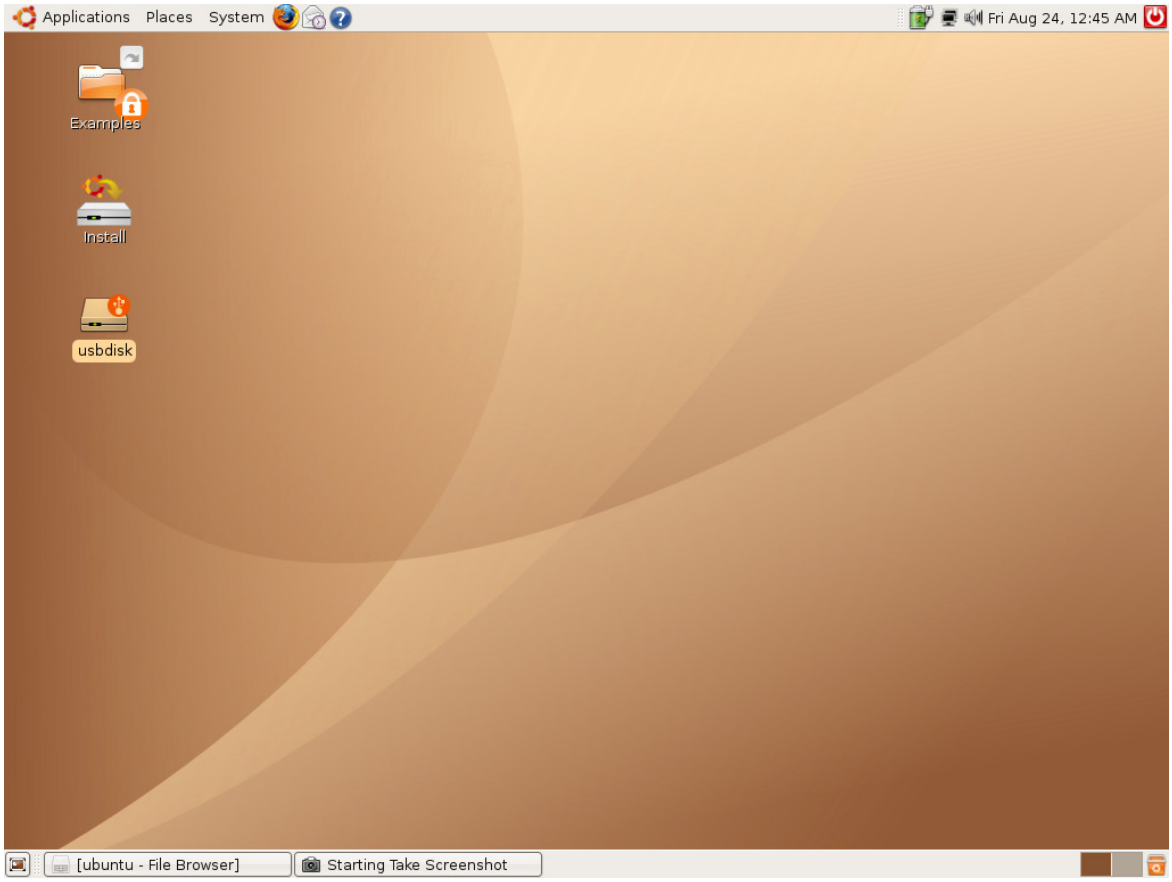

Figure 19. The SD drive icon is shown on Ubuntu desktop.

On certain Linux distributions that do not have the capability to mount CDROM automatically, the command line interface (also known as the Linux Shell) can be used to mount the micro SD card on the system using the following command:

sudo mount /dev/sdb0 /media/disk

Assuming that /media/disk is an empty directory available for mounting, and that sdb0 is the device special file associated with the micro SD storage card.

Once the device has switched to Modem and Storage mode you should now be able to configure the device to be recognized by the Linux OS as was mentioned in the “Setting up your system” steps 1-3 above. Once the device is recognized by the device you should be able to connect with KPPP.

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WORKING WITH MULTIFUNCTIONAL DEVICES

Many devices now support multiple modes of operation such as CD, Mass Storage and Modem mode. If you are using one of these types of devices you may want to follow the steps below to make sure you have your configuration setup correctly.

Novatel

Below are the setup steps used for validating your Novatel U727 with Zero CD install.

1) ***Insert device***
2) ***CDROM0 auto mounts***
3) ***Open Terminal***
4) ***Type "sudo modprobe –r usbserial"***
5) ***Type "sudo modprobe usbserial vendor=0x1410 product=0x4100"***
6) ***Type "sudo eject /cdrom (***It could be /dev/sr0, or /dev/sr1 …etc.)
7) ***Device changes to modem mode***
8) ***Type "sudo dmesg|grep –i ttyUSB"to confirm the driver is loaded***
9) ***Launch KPPP***
10) ***Connect***

Sierra

Sierra TRU-Install devices require a kernel patch to work correctly. In order for TRU-install devices to be recongnized you must be running kernel 2.6.24 or above.

You can check your kernel version by using the following command "uname –r". This can also be validated by checking in the source directory by performing a "ls /usr/src".

To download the latest kernel you can vist the http://www.kernel.org/

If your kernel is not updated to the correct version after a eject of the CD the Sierra TRU-install devices will indicate a product ID=0FFF when you type "lsusb"

NOTE: Applying a kernel upgrade can be very risky if you do not know what you are doing or try and apply the wrong patch update. Please consult you distribution for the proper methond of upgrading the kernel to the latest version.

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Below are the setup steps used for validating you Sierra Compass 597 with TRU-install.

1) ***Insert device***
2) ***CDROM0 auto mounts***
3) ***Open Terminal***
4) ***Type "sudo modprobe –r usbserial"***
5) ***Type "sudo modprobe usbserial vendor=0x1199 product=0x0023"***
6) ***Type "sudo eject /cdrom (***It could be /dev/sr0, or /dev/sr1 …etc.)
7) ***Device changes to modem mode***
8) ***Type "sudo dmesg|grep –i ttyUSB"to confirm the driver is loaded***
9) ***Launch KPPP***
10) ***Connect***

Below are the setup steps used for validating you Sierra 597E with TRU-install.

1) ***Insert device***
2) ***CDROM0 auto mounts***
3) ***Open Terminal***
4) ***Type "sudo modprobe –r usbserial"***
5) ***Type "sudo modprobe usbserial vendor=0x1199 product=0x0021"***
6) ***Type "sudo eject /cdrom (***It could be /dev/sr0, or /dev/sr1 …etc.)
7) ***Device changes to modem mode***
8) ***Type "sudo dmesg|grep –i ttyUSB"to confirm the driver is loaded***
9) ***Launch KPPP***
10) ***Connect***

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WORKING WITH AT COMMANDS

To start off you may want to install a terminal emulation program such as minicom. This should allow you to talk to the modem.

"sudo apt-get install minicom"

http://www.strdoc.net/hyperterminal-replacement-ubuntu-minicom

http://tldp.org/HOWTO/Modem-HOWTO-11.html

Example:

Minicom –s /dev/ttyUSB0

NOTE: A helpful tip is while using Minicom you can access the help by entering control A followed by Z.

You can also use KPPP Mini-Terminal within the edit modem tab to query the modem or open a terminal window to execute AT commands.

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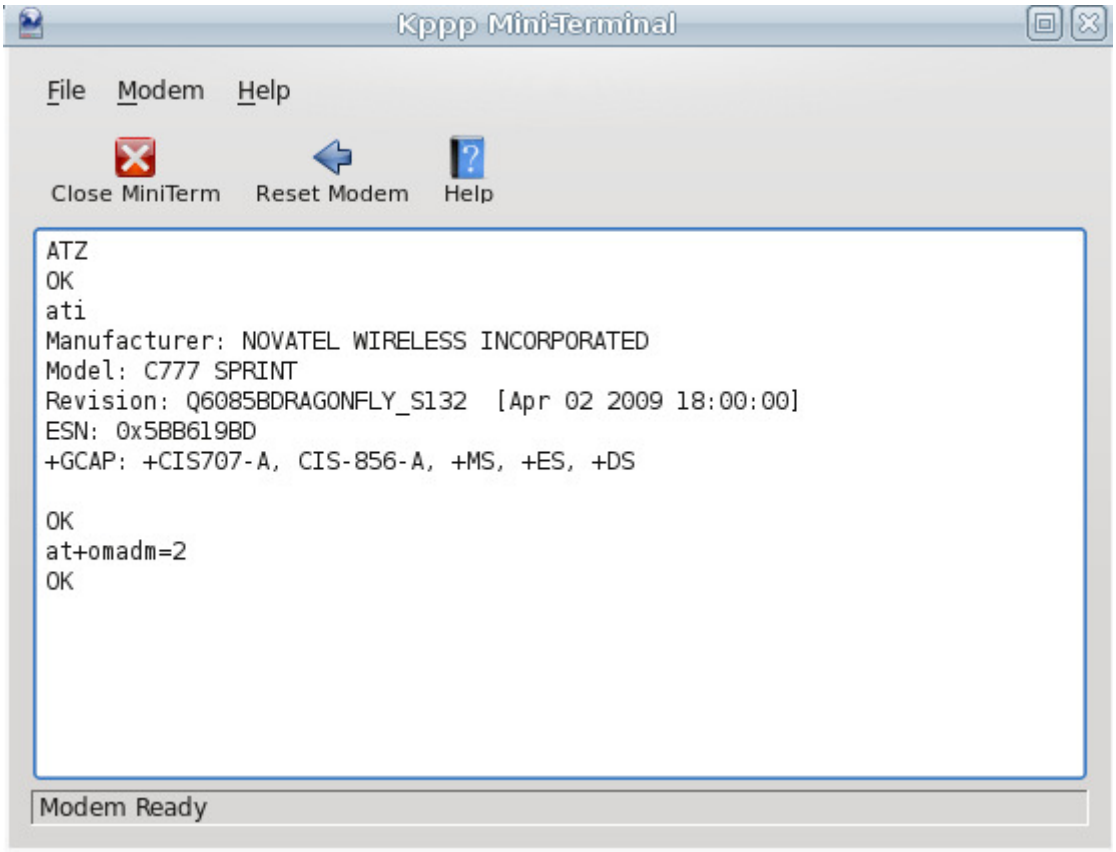
Activation

If you are using a device like a Novatel 760/C777 you maybe able to run “at+omadm=2” to activate the device. You can validate you device programming by executing “at$qcmipgetp”.



Multifunctional devices:

Disabling CD mode on Novatel devices:

This works on any device with CD auto install: U727, U760

AT$NWAUTOINSTALL=[0 | 1] 0 = disable, 1 = enable
AT$NWAUTOINSTALL? (reports auto install state [0|1])

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TROUBLESHOOTING

http://www.ubuntugeek.com/ubuntu-network-troubleshooting-tips.html

Dropped connection:
In the event that the connection is lost due to any reason, a manual reconnect is required. You can configure your Connection to automatically redial on disconnect.

DNS issues
For DNS-related issues, please verify entries in /etc/resolv.conf file
"sudo gedit /etc/resolv.conf". Please refer to your Linux distribution's user manual for more information about fixing this problem. Example below.

```
nameserver 68.28.82.91
nameserver 68.28.90.91
#Generated by Network Manager
```

This should be auto generated by the Network Manager if you have selected to have the DHCP server provide the DNS.

You can also determine what is going on by tailing the /var/log/messages file to see if you are getting the DNS during PPP and DHCP setup.

Tail –f /var/log/messages

Default Gateway

If you are still having issues with accessing the internet you may want to validate you have a default route set correctly. You can determine this by using the "route" command. You need to have a default route line or you will not be able to access the internet. Example below:

```
luzar@ubuntu:~$ route
Kernel IP routing table
Destination  Gateway         Genmask         Flags Metric Ref  Use Iface
localnet     *               255.255.255.0   U     0      0      0  eth0
default      mygateway1.ar7  0.0.0.0         UG    100    0      0  eth0
luzar@ubuntu:~$
```

NOTE: If you do not have a default route available and you are using KPPP you can try and Edit the Account setup and check the "Assign the default route to this gateway" checkbox in the Gateway tab.

Web browsing

Many distributions of Linux do not come with Java or Flash by default so it is reccommended you install or upgrade to the latest versions to better improve you surfing experience.

http://www.ubuntugeek.com/how-to-install-java-runtime-environment-jre-in-ubuntu.html

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Startup scripts

Currently everytime the Laptop/PC reboots steps #2-3 need to be re-entered. If you follow the steps below you should be able to overcome this issue.

After successfully configuring the system, you may enter the following commands in /etc/rc.local file as root:

1. Open the file for editing, I used vi editor for simplicity in opening as root user:

"sudo vi /etc/rc.local"

or

"sudo gedit /etc/rc.local" if using Ubuntu

2. Using your editor of choice , enter the following lines . Insert the lines before exit 0, if it pre-exists in the file:
   "/sbin/modprobe –r usbserial"
   "/sbin/modprobe usbserial vendor=0x1410 product=0xABCD"

   Where 0xABCD is your modem's product ID that was determined using Table 1.

3. Save the file and exit editing.
4. Enter "ls –al /etc/rc.local" and check execute permissions. If the file does not have execute permissions (the "x" in each group shown below) similar to the following:
   "-rw**x**r-**x**r-**x** 1 root root 390 2007-02-15 11:12 /etc/rc.local"
   then enter the following command to make the rc.local file executable:
   "sudo chmod a+x /etc/rc.local"

5. Reboot your machine.

You do not have to enter any configuration commands any more in the future since /etc/rc.local will be run at the end of each multi-user runlevel (i.e., think of it as system reboot).

Additional support links

http://www.sierrawireless.com/faq/ShowFAQ.aspx?ID=607

http://www.kernel.org/

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